

Impact of Artificial/Machine Vision in Blind Patients



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DISCLOSURES



- Authors have no financial disclosures

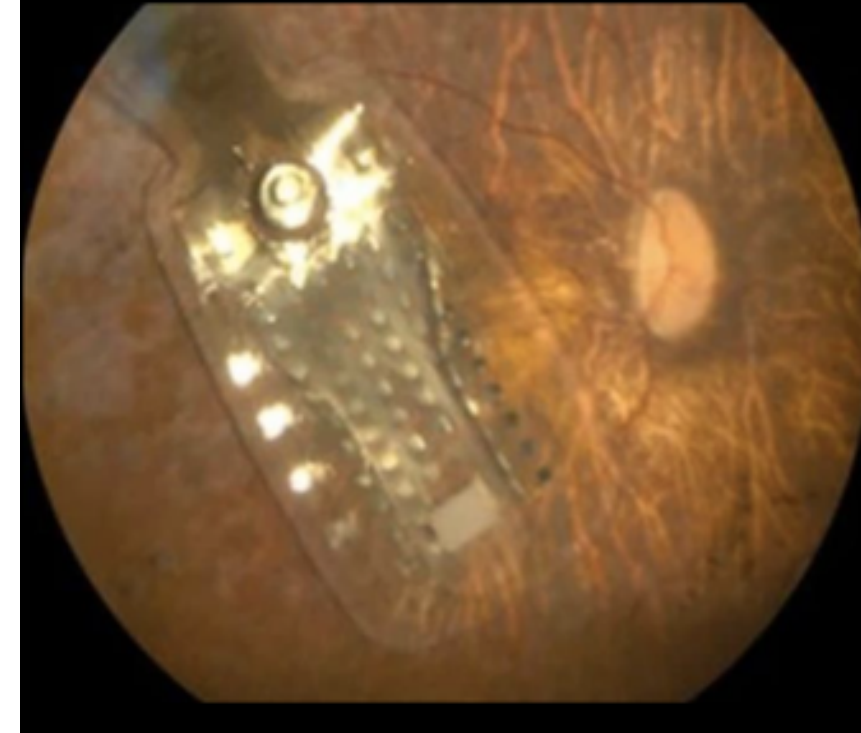


SUMMARY

- Argus II is a retinal implant that provides artificial/machine vision to those blinded by retinitis pigmentosa.
- Evaluating the usefulness of this artificial vision is difficult using Snellen charts; therefore, we used a Visual Function Questionnaire to assess its impact on their quality of life.
- Each category assessed, including general health and vision, difficulties with activities, and response to vision problems, was significantly improved with machine/artificial vision ($p < 0.001$)
 - There were also no negative impacts on quality of life.
- In conclusion, our patients' blind lives are significantly improved after Argus II implantation.

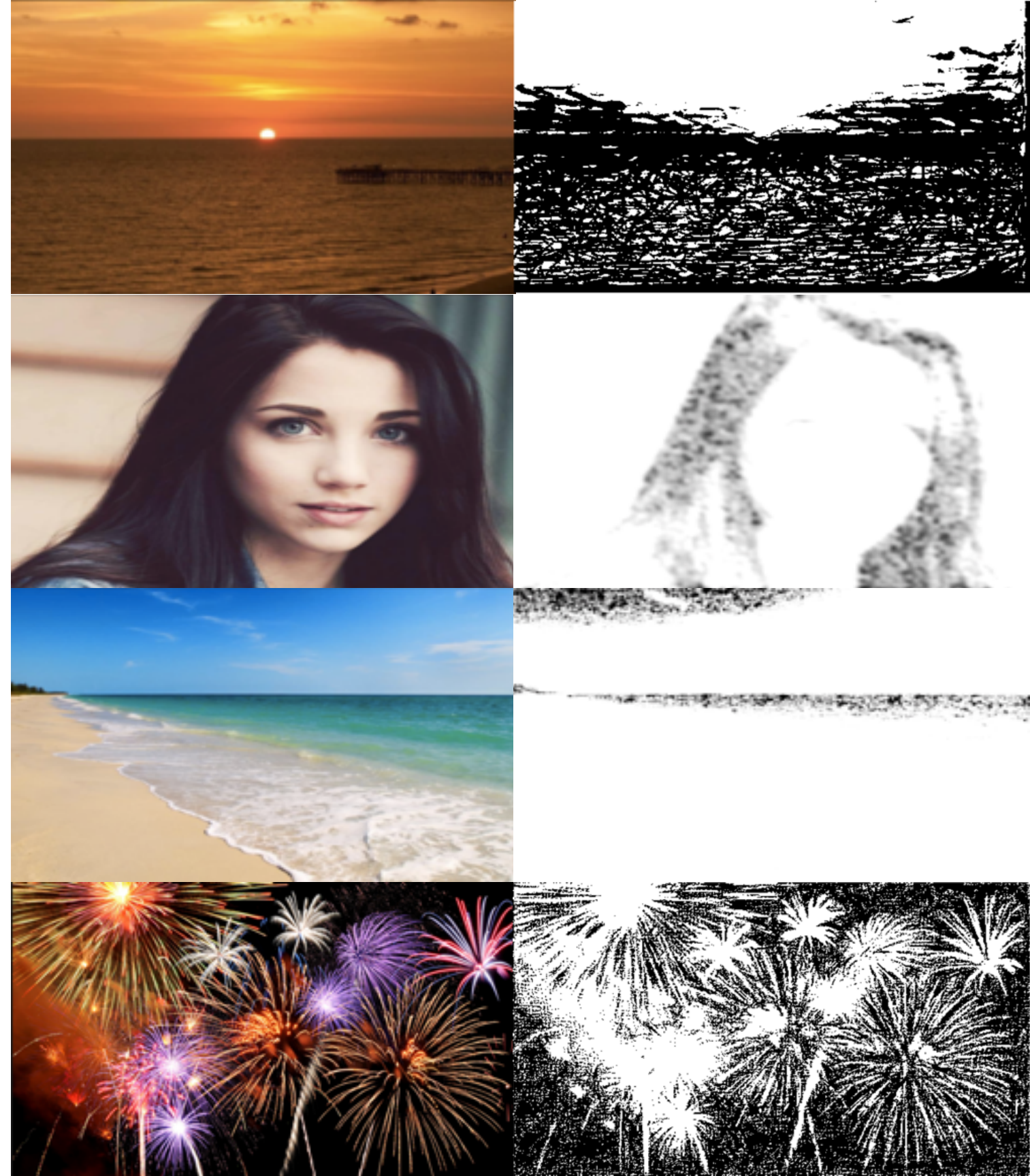
BACKGROUND

- Argus II is a retinal implant that provides artificial/machine vision to those who are blinded by retinitis pigmentosa.
 - External camera, video processing unit, 3x5mm electrode array
 - LP or NLP in both eyes
 - Must be willing and able to follow up and undergo training
- While this artificial vision is not an exact replacement for natural sight, patients can recognize shapes and perceive the contrast between light and dark objects.
- It's almost like having a sixth sense but patients have to train how to use it.



PURPOSE

- It is challenging to assess this machine vision using standard measurements.
- Our purpose is to assess the impact this vision has made on our patients' blind lives
- Visual function questionnaire (VFQ) to analyze patients' quality of life pre and post Argus II implantation.



METHODS



- A 25 question National Eye Institute VFQ was administered to 17 patients with mean age of 57 who had received the Argus II implant and completed training
- Measured the impact of machine vision on overall health, including social wellbeing and dependence on activities of daily living. We also included 13 additional questions to further assess quality of life.
- ANOVA analysis with Bonferroni adjusted p-values compared the graded survey results from pre and post Argus II implantation.

RESULTS

- Each overall category was significantly improved after Argus II implantation.
- Improved perception of vision ($p=0.0005$), ability to find objects ($p=0.002$), function around stairs/curbs ($p=0.002$), and match clothes ($p<0.001$).
- Patients also stated they could accomplish more tasks ($p<0.001$) and were less dependent on others ($p<0.001$).

Question		pre-op	post-op	p-value	adjusted p-value
General health and vision					
1	General Health	5.76	5.76	n/a	n/a
2	Eye sight	6.00	5.24	0.0000	0.0005
3	Worry about eyesight	5.24	5.70	0.0156	N.S
4	Discomfort around eyes	1.12	1.29	0.1876	N.S
Total		12.56	11.59	0.0000	0.0000
Difficulties with activities					
5	Reading newspaper	5.00	5.00	n/a	N.S
6	Close up vision	5.00	4.83	0.0826	N.S
7	Finding something	5.00	4.35	0.0001	0.0027
8	Reading street signs	5.00	5.00	n/a	n/a
9	Stairs and Curbs	5.00	4.36	0.0001	0.0027
10	Side vision	5.00	4.88	0.1655	N.S
11	People reaction	5.00	5.00	n/a	n/a
12	Matching clothes	5.00	4.24	0.0000	0.0000
13	Visiting people	5.00	4.82	0.0826	N.S
14	Games, plays and sport	5.00	5.00	n/a	n/a
15	Current driving	2.00	2.00	n/a	n/a
15a	Gave up driving	2.00	2.00	n/a	n/a
15b	why gave up driving	1.00	1.00	n/a	n/a
16	Night driving	5.00	5.00	n/a	n/a
16a	living difficult condition	5.00	5.00	n/a	n/a
Total		64.94	62.47	0.0000	0.0001
Response to vision problems					
17	Accomplish less	1.00	2.24	0.0000	0.0000
18	Limited in working	1.00	2.29	0.0000	0.0000
19	Pain around eyes	5.00	4.76	0.1057	N.S
20	Stay home	1.00	1.35	0.0547	N.S
21	Frustration	1.00	1.34	0.0413	N.S
22	Less control	1.00	1.41	0.0299	N.S
23	Rely on people	1.39	1.85	0.0121	N.S
24	Help from people	1.71	1.71	n/a	n/a
25	Embarrassment	1.43	1.41	n/a	n/a
Total		14.71	18.06	0.0000	0.0000

RESULTS



- Our supplemental questions tried to address activities of daily living not well addressed by the overall VFQ
- Showed improvement in general vision ($p=0.01$), outdoor activities ($p=0.03$) and less limitation in their activities ($p=0.01$).
- Eye pain, discomfort, worry about eyesight, frustration and embarrassment questions were not significantly different in either group

		Additional questions			
A1	General Health	8.88	8.88	n/a	n/a
A2	General vision	0.00	2.00	0.0003	0.0122
A3	Small Print	5.00	4.82	0.0826	N.S.
A4	Bills and checks	5.00	3.83	0.0826	N.S.
A5	Shaving/hairing	5.00	5.00	n/a	n/a
A6	Recognize people	5.00	4.65	0.0826	N.S.
A7	Outdoor activities	5.00	3.82	0.0008	0.0399
A8	Seeing TV	5.00	5.00	n/a	n/a
A9	Entertaining friends	5.00	4.65	0.0098	N.S.
A10	Driving	5.00	5.00	n/a	n/a
A11a	More help from people	3.53	3.65	0.1635	N.S.
A11b	Limited activities	1.00	2.59	0.0004	0.0176
A12	Irritability	1.65	1.65	n/a	n/a
A13	Going out alone	1.41	1.65	0.1635	N.S.
Total		56.47	58.18	0.0417	N.S.
Overall score		94.24	92.06	0.0002	0.0115

CONCLUSION



- The Argus II system is not an exact replacement for natural sight — patients can recognize shapes and perceive the contrast between light and dark objects.
- It's almost like having a sixth sense once you train how to use it.
- Patients' overall quality of blind life is significantly improved after Argus II implantation, which includes activities of daily living and social wellbeing, such as the ability to match clothes.
- All three broad categories of the VFQ-25 were improved as well as several individual factors.
- Importantly, there were also no negative impacts on quality of life.

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